

MEMORANDUM OF AGREEMENT
between the
FEDERAL AVIATION ADMINISTRATION
and the
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
concerning
ACCIDENT AND INCIDENT MITIGATION RESEARCH

1. PURPOSE

This Memorandum of Agreement (MOA) establishes a cooperative research program between the National Aeronautics and Space Administration (NASA) and the Federal Aviation Administration (FAA) for the research and development of technology to mitigate the effects of aviation accidents, increase survivability, and prevent fire-related incidents and accidents. This MOA is covered by the FAA/NASA Memorandum of Understanding concerning Aviation Safety Research, Number FNA-08, dated July 2, 1999.

2. BACKGROUND

The FAA and NASA are committed to the national goal of reducing aviation fatalities. To reach this goal, the number of survivors must be increased in accidents that are of the severity level where some, but not all, passengers survive. Data show that for transports, half of all accidents involve serious injury and/or fatality, and half of those accidents are survivable (i.e., greater than three survivors). Fatalities are the result of impact trauma, fire/smoke, inability to escape, or some combination of both (e.g., nonfatal injuries or egress conditions that prevent escape and lead to being overcome by smoke). Further, the prevention of in-flight fires, which account for 5 percent of all fatalities, is also critical to the national goal of reducing aviation fatalities.

Accident mitigation technologies have been a conspicuous portion of the Federal Aviation Administration (FAA) aviation research program for several years. Accident and incident mitigation technologies were identified early in the NASA safety program planning process (i.e.: Aviation Safety Investment Strategy Team, ASIST) as critical to address the issue of aviation safety. NASA's Aviation Safety Program (AvSP) will provide research and technology products needed to help the FAA and the aerospace industry achieve the challenge to improve aviation safety in the coming decade and beyond.

3. SCOPE/OBJECTIVE

This agreement encompasses the cooperative efforts required to enable, develop, and promote the implementation of technologies to increase human survivability in accidents and to prevent fires. The results will be used to increase survivability for both passengers and crew.

Areas of research to be included under accident and incident mitigation and related objectives are: (1) Crashworthiness and (2) Fire safety and cabin evacuation. The objective of crashworthiness research is to develop a systems approach to reduce the number of fatalities and severe injuries due to ground and water impacts. The objective of fire safety research is to reduce fatalities and injuries and increase survivability in fires due to post-crash circumstances and ground operations mishaps, and to prevent in-flight fires.

The overall technical objectives of the efforts covered by this agreement are fivefold:

- (1) develop analytical tools to allow more efficient crashworthiness design and certification,
- (2) reduce the physical crash dynamics hazards,
- (3) minimize fire effects in order to allow more time for evacuation,
- (4) reliably detect in-flight fires and explosions, and
- (5) prevent and suppress in-flight fires and explosions.

Activities covered by this MOA will be conducted at NASA's Glenn, Langley, and Ames Research Centers, as well as the FAA's William J. Hughes Technical Center and the Civil Aeromedical Institute (CAMI).

4. STATEMENT OF WORK (SOW)

NASA and the FAA will focus their efforts on defining tasks to meet the overall goals/objectives of this MOA and on ensuring a coordinated series of activities that will lead to mitigating the effects of aviation accidents, increasing survivability, and preventing fire-related incidents and accidents. The following statement-of-work task elements define the scope of this Memorandum of Agreement. Copies of the FAA and NASA Project Plans are attached. These plans detail the respective multi-year R&D efforts. These plans include:

FAA:

- FAA Research Project Description (RPD) 502 - Aircraft Crashworthiness
- FAA Research Project Description (RPD) 558 - Aircraft Fire Safety and Cabin Safety
- FAA Research Project Description (RPD) 517 - Fire Resistant Materials
- FAA Research Project Description (RPD) 532 - Aeromedical Research

NASA:

- Accident Mitigation Project Plan

A. TASKS

The FAA and NASA will jointly perform the activities listed below. The activities will include, but not be limited to, the following phases (as appropriate for the task or sub-task): systems requirements, systems assessments, concept definition, numerical analysis and analysis validation testing, ground-based component through system testing, and flight tests.

(1) Crashworthiness

Research focused on improving occupant protection and reducing hazards during a crash, including, but not limited to:

- defining the crash environment and the loads;
- identification of biomechanics and injury criteria;
- developing and validating dynamic analysis methodologies as crashworthiness prediction, design, certification, and accident investigation tools;
- formulating design guides and developing technology for use by developers of new components, restraints, seats and airframes;
- developing guidance for seat performance measurements and certification processes;
- developing, prototyping, and validating new seat and restraint concepts;
- determining practical ways of making cabin interiors safer; and
- developing structural technology and design concepts to provide energy absorption.

(2) Fire Prevention

Research focused on preventing fires (and explosions) and reducing potential hazards, including, but not limited to:

- developing more crashworthy aircraft fuel systems;
- developing improvements to oxygen systems to minimize fire hazards;
- developing gas separation technologies, components and prototype systems to provide ground-based inerting capability for fuel tanks;
- developing advanced gas separation technologies, components and prototype systems to provide on-board generation of on-demand and/or continuous nitrogen for fuel tank inerting and oxygen for crew and passenger breathing;
- developing fire test criteria for materials in hidden areas;
- identifying and evaluating fuel technologies to minimize tank ullage flammability; and
- identifying and determining human factors effectiveness of personal protective equipment.

(3) Fire Protection

Research focused on detecting, suppressing and minimizing the effects of fires, including, but not limited to:

- establishing a standard smoke and heat (fire) simulant and prescribed test procedures for approval testing of new smoke/fire detectors;
- developing false-alarm-free detection concepts, focusing on advanced micro-fabricated gas sensors, multiple sensors, and computer-aided signal analysis;
- developing minimum performance standards for halon replacement agents;
- establishing design criteria for on-board, post-crash cabin fire suppression systems;
- identifying and evaluating technologies to minimize fuel flammability in post-crash situations;
- collecting a database of heat release rates and ignitability of emerging materials;
- developing computational models of solid-state and gas phase combustion processes to understand material flammability; and
- developing cost-effective strategies for ultra-fire resistant aircraft interior materials.

(4) Cabin Evacuation

- identifying optimum seat/aisle configurations to support rapid evacuation;
- identifying procedures/cabin crew actions that improve cabin egress efficiency;
- developing cabin evacuation models to improve aircraft certification accuracy and cost; and
- determine impact of post-crash fire suppression on cabin evacuation.

B. RESOURCES

Personnel - To meet these responsibilities, the FAA and NASA will staff the project in accordance with the following profile:

Planned Staffing

	<u>FY-01</u>	<u>FY-02</u>	<u>FY-03</u>	<u>FY-04</u>	<u>FY-05</u>
FAA	42	42	42	42	42
FAA**	2	2	2	2	2
NASA	<u>12</u>	<u>13.5</u>	<u>14</u>	<u>14</u>	<u>14</u>
Total	56	57.5	58	58	58

**Detailees employed by FAA, working at NASA Langley Research Center, Hampton, Virginia.

Funding - The FAA will be responsible for funding all of the tasks within its area of responsibility, as specified above. NASA will be responsible for funding all the tasks within its area of responsibility, as specified above. Total planned funding to conduct the tasks is listed in this section. The funding shown is for planning purposes only and does not constitute authority to commit, obligate, or expend funds except as authorized by NASA and FAA procurement officials.

Upon obtaining the appropriate approvals, each agency will utilize its authority to award contracts, grants, and other transactions to accomplish activities under this MOA. Such awards are to be made in accordance with applicable agency/center policies and procedures.

(1) Transfer of Funds

To the extent funds may be transferred between FAA and NASA for services and/or goods provided on a reimbursable basis, the authority of the Economy Act, as amended, 31 U.S.C. §§ 1535 and 1536; Section 203(c) of the National Aeronautics and Space Act, as amended, 42 U.S.C. § 2473(c); or sections 226 and 227 of the FAA Reauthorization Act of 1996, 49 U.S.C. § 106 (l)(6) and (m), as applicable, may be cited. The reimbursable agreement document is an interagency agreement (IA) for the FAA and a purchase order (PO) for NASA, or other authorized method of intergovernmental funding transfer.

This agreement is mutually beneficial to both NASA and FAA with both agencies waiving any administrative and/or program overhead costs for transferred funds.

(2) Anti-Deficiency Act

All activities under or pursuant to this agreement are subject to the availability of appropriated funds, and no provision shall be interpreted to require obligation or provision of funds in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341.

Planned Funding to Conduct Tasks
(\$ in millions, FY 0\$)

	<u>FY-01</u>	<u>FY-02</u>	<u>FY-03</u>	<u>FY-04</u>	<u>FY-05</u>
FAA	7.1	7.0	7.2	7.4	7.6
(in-house, contract, grant)					
FAA	0.1	0.2	0.2	0.2	0.2
(transfer to NASA)					
NASA	4.6	6.6	8.3	8.5	9.0
(in-house, contract, grant)					
NASA	1.0	1.3	1.5	1.5	2.0
(transfer to FAA)					
Total	12.8	15.1	17.2	17.6	18.8

Facilities - To the extent necessary to meet the responsibilities of performing these individual and joint activities, the FAA and NASA will make available the following facilities:

FAA: Ground-based Aircraft
 Fire Hangar, Small-Scale Fire, and Explosion Test Facilities
 Fire Material Characterization Labs
 Drop Tower
 Sled Test Facilities
 CAMI Biomechanics Facilities
 CAMI Cabin Environment/Evacuation Facilities

NASA: Impact Dynamics Research Facility and Small Scale Test Machines
 Instrumentation, Combustion, and Fuels Test Laboratories
 Research Aircraft

Equipment - To meet these responsibilities and provide coordination, the FAA and NASA will loan and/or utilize test equipment and test prototypes associated with these facilities and tasks. Test equipment shall include, but not be limited to, anthropomorphic test dummies, instrumentation, data acquisition, and data processing equipment. Test prototypes shall include, but not be limited to, sensors, gas generation packages, aircraft components, and subsystems.

C. SCHEDULE

Execution of the FAA and NASA tasks in section 4A will span fiscal years FY-01 through FY-05. The planning schedule details can be found in the planning documents specified in section 4, above.

D. REPORTS

Technical reports generated from work performed under this agreement will be published, in accordance with section 7 of this document, by the organization having primary responsibilities, with due acknowledgment and credit given to each organization's contribution. Research results and deliverables will be released through routine FAA and NASA channels.

5. REPRESENTATIVES

A. TECHNICAL REPRESENTATIVES

The individuals listed below are responsible for the oversight of this MOA at their respective headquarters and/or centers; however, they do not have the authority to alter any of the terms of this MOA. Any requests for changes must be made in accordance with section 9 of this document. The central point of interagency coordination and information for this MOA is the FAA R&D Field Office at NASA Langley Research Center, Hampton, Virginia.

1. Douglas A. Rohn, NASA Glenn Research Center,
tel: (216) 433-3325, fax: (216) 977-7051, douglas.a.rohn@grc.nasa.gov

2. Constantine Sarkos (AAR-422), FAA William J. Hughes Technical Center,
tel: (609) 485-5620, fax: (609) 485-5785,
sarkosc@tc.faa.gov.

B. CONTRACTUAL REPRESENTATIVES

Should this MOA result in the transfer of funds between FAA and NASA, procurement officials will be designated at the respective headquarters and/or centers. These officials will be listed in the interagency agreement (IA) for the FAA or a purchase order (PO) for NASA, or other authorized method of intergovernmental funding transfer.

Disputes Resolution

In accordance and compliance with appropriate FAA and NASA policies and procedures, all representatives will attempt to resolve any disputes arising from the implementation of this MOA. If they are unable to come to agreement on any issue, then the dispute will be referred to the NASA and FAA Program Directors, or their designated representatives, for joint resolution.

6. LIABILITY AND RISK OF LOSS

Each party agrees to assume liability for its own risks associated with agreements and activities undertaken in this MOA.

7. INTELLECTUAL PROPERTY AND DATA RIGHTS

Dissemination of Information

To the extent permitted by applicable laws and policies, the initial release of any information to the public, whether oral or written, concerning results or conclusions reached in the performance of this MOA require prior written approval of the Representatives, FAA and NASA, as named in section 5.

Patent and Invention Rights

The Government shall have government purpose rights to technical data developed as a consequence of, or as a consequence of, or in direct relation to the performance of activities under this agreement. Custody and administration of inventions made as a consequence of, or in direct relation to, the performance of activities under this agreement will remain with the respective inventing party. In the event an invention is made jointly by employees of the parties or an employee of a party's contractor, the parties will consult and agree as to future actions toward establishment of patent protection for the invention.

8. PERIOD OF PERFORMANCE

The period of performance for this research program shall commence upon the effective date of this agreement and shall remain in effect for five years.

9. MODIFICATION/AMENDMENTS/TERMINATION

This MOA may be modified only upon the mutual written consent of both agencies. Modifications must be signed by the authorized representatives of the FAA and NASA, or their designees. No oral statement by any person shall be interpreted as modifying or otherwise affecting the terms of this agreement.

Right to Terminate

Either agency may terminate this MOA upon 180 days written notice to the other agency, signed by the authorized representative of the terminating agency, or the designee of such representative. The notice shall reference the title and identifying number of this MOA, and shall contain the effective date of the termination. Upon termination, each agency will refund any portion of those funds that have been advanced by the other agency, but not yet expended in connection with work under this MOA.

10. AUTHORITY

A. NASA

This agreement is entered into by NASA pursuant to Section 203(c) of the National Aeronautics and Space Act of 1958, as amended, 42 U.S.C. § 2473(c).

B. DOT/FAA

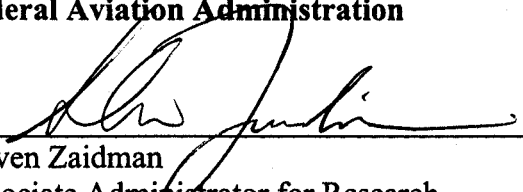
This agreement is entered into by FAA pursuant to Sections 226 and 227 of the FAA Reauthorization Act of 1996, 49 U.S.C. § 106 (l)(6) and (m).

C. FAA/NASA Executive Committee

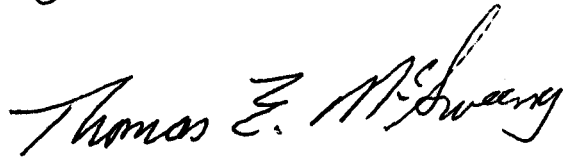
This cooperative activity is established under the agreement for cooperation between the FAA and NASA signed by the Administrators on October 9, 1998, entitled "A Partnership to Achieve Goals in Aviation and Future Space Transportation."

APPROVAL

**Department of Transportation/
Federal Aviation Administration**



Steven Zaidman
Associate Administrator for Research
and Acquisitions

Date: June 21, 2001


Thomas E. McSweeney
Associate Administrator for Regulation
and Certification

Date: JUN 20 2001

**National Aeronautics and Space
Administration**


Samuel L. Verner
Associate Administrator for Aerospace
Technology

Date: June 11, 01